UNIVERSITY OF MIAMI
DEPARTMENT of COMPUTER SCIENCE

# An investigation of congenital agenesis of the corpus callosum

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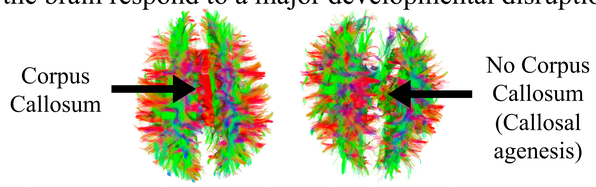
## Introduction

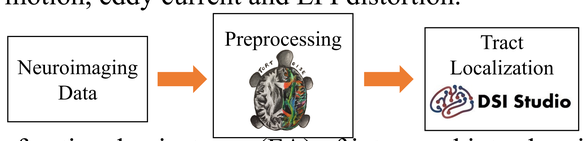
- Individuals with congenital agenesis of the corpus callosum present the unique opportunity to study the way connections of the brain respond to a major developmental disruption.




- Previous research in a patient who has undergone commissurotomy to alleviate intractable epilepsy demonstrated that increased structural integrity in subcortical pathways may facilitate inter-hemispheric communication after white matter fibers of the corpus callosum are surgically severed.
- We hypothesized that similar to what was observed in the commissurotomy patient, white matter pathways in a child with callosal agenesis would show increased integrity of subcortical pathways as a compensatory mechanism.

## Methods

- Neuroimaging data (MRI) were examined for a 12-year-old child with congenital agenesis of the corpus callosum and ten age-matched control subjects.
- Diffusion weighted imaging data were preprocessed to correct for motion, eddy current and EPI distortion.



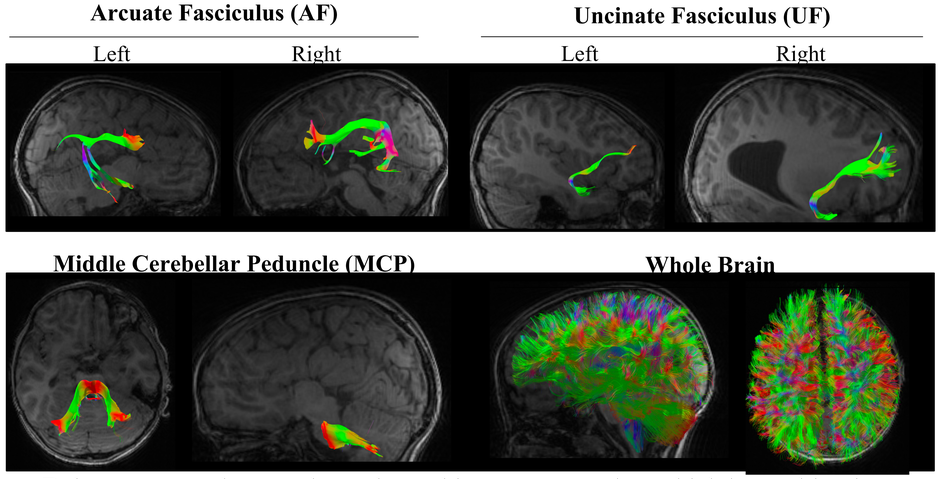

- The fractional anisotropy (FA) of inter- and intra-hemispheric white matter pathways was measured and compared.
- Major white matter tracts were identified using region-of-interest (ROI) localization.

| Tract | Function | Location of ROI(s) and ROA(s) |
|---|---|---|
| **Arcuate Fasciculus** | • Connects Broca's and Wernicke's areas | |
| **Uncinate Fasciculus** | • Connects parts of the limbic system to the frontal lobe | |
| **Middle Cerebellar Peduncle** | • Cross-hemispheric<br>• Connects the cerebellum and pons | |

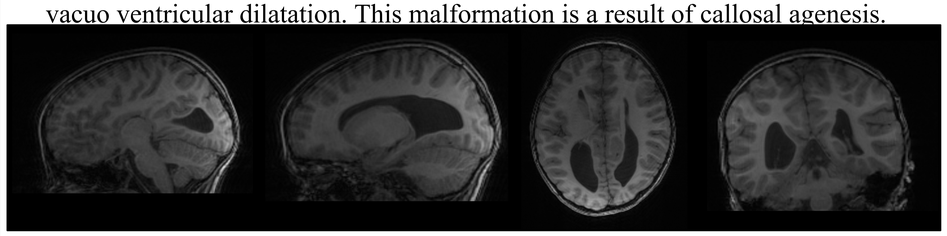
| Key |
|---|
| ROI 1 |
| ROI 2 |
| ROI 3 |
| ROA |

## Results

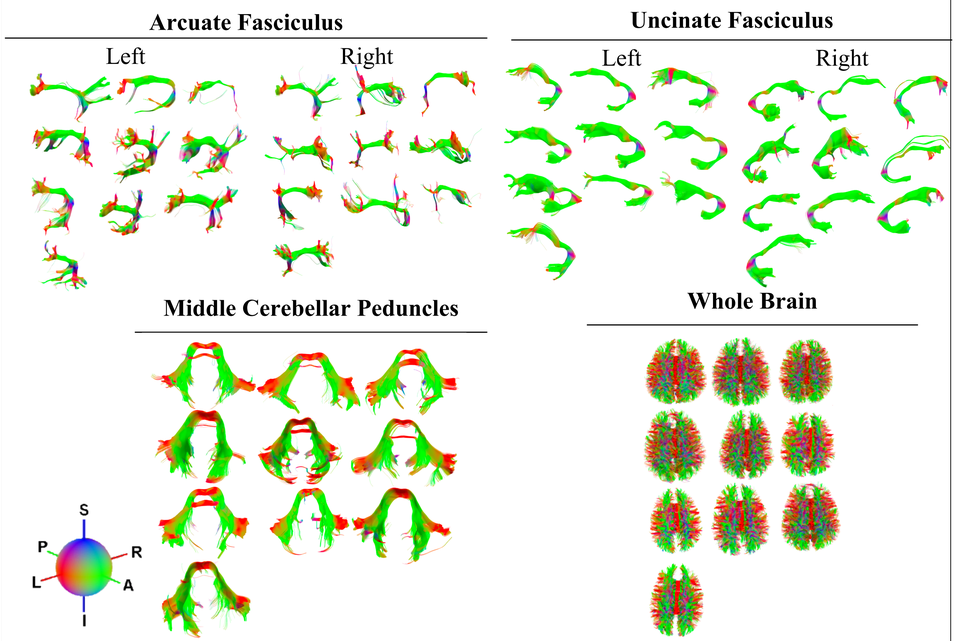
*Congenital Agenesis of Corpus Callosum*




Below, structural scans show clear white matter paucity, which is resulting in ex-vacuo ventricular dilatation. This malformation is a result of callosal agenesis.

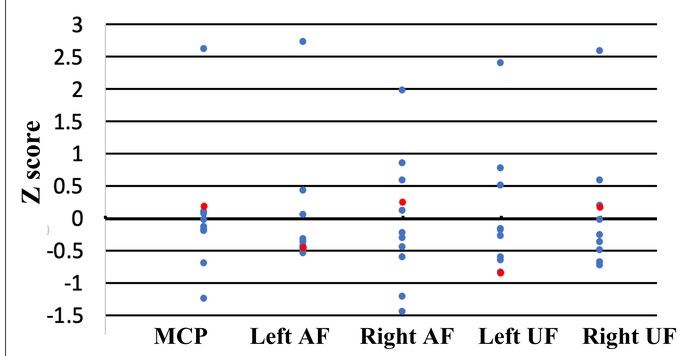


*Typical age matched peers*




## Fractional Anisotropy

*Inter-Hemispheric Fibers*




## Discussion

- Despite organizational differences in important white matter structures, the overall FA in white matter structures in the callosal agenesis patient are not significantly different from typically developing peers.
- These findings suggest that the developing brain of the patient with agenesis does not use a subcortical interhemispheric pathway to compensate for the lack of interhemispheric white matter pathways, as previously demonstrated in an adult commissurotomy patient.
- Our results contribute to a better understanding of the brain's plasticity, particularly with respect to inter-hemispheric white matter pathways.

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## References

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